Brisbane Water

□ Electrical □ Mechanical □ Water Meters
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4th February 2000

OPERATING MANUAL FOR:

COMPTON ROAD 600 dia S21 TRUNK MAIN RELOCATION

CATHODIC PROTECTION SYSTEM

CLIENT:

BRISBANE CITY WORKS
PIPES AND BRIDGES

MANUAL CONTENTS

DRAWINGS

(1.0) INTRODUCTION

Steel when immersed or covered in water has a tendency to corrode (or rust) as the oxidized form is more stable than the metal.

Because of this, precaution must be taken to stop or minimize the corrosion reaction to an acceptable level consistent with the design life of the structure. This is normally achieved by the use of protective coatings which control the corrosion reaction by isolating the steel from its surrounding environment.

However, it is not practical to achieve a perfect coating and coating damage will always occur with time. Because of this, corrosion may occur at imperfections in the paint coating, causing further deterioration in the coating as well as loss of metal.

As a result of this, the coating defects must be rectified by periodic maintenance or an additional method of protection used to prevent this deterioration and corrosion occurring. This additional protection is achieved by the cathodic protection system.

(2.0) CORROSION AND CATHODIC PROTECTION

Corrosion is an electrochemical process in that it is accompanied by a flow of electrical current.

Corrosion occurs on the surface of metals at active areas known as anodes, which are electrically continuous with less active or passive areas known as cathodes. The electric current flows from the anode through the electrolyte to the cathode, with the circuit being completed by the electrical continuity between the cathode and anode. In practice anodes and cathodes are generally part of the same metallic surface and individual anodic areas may be small.

In applying cathodic protection an external current is applied to the surface so that the entire surface to be protected acts as a cathode. This involves the use of an auxiliary anode and when the current flow from this anode is sufficient, no part of the structure acts as an anode.

While it is the flow of current which achieves the cathodic protection of the surface it is impractical to measure these currents over individual anodic areas to determine when cathodic protection has been achieved. However, with the flow of cathodic protection current, the structure becomes more negative with respect to the surrounding electrolyte. Because of this, it is possible to state values of metal/electrolyte potential at which corrosion does not occur. This metal/electrolyte potential is generally measured against a standard reference electrode which allows a reproducible potential at which corrosion does not occur to be quoted.

(3.0) MAINS DETAILS

Size: 600 mm Dia mild steel cement lined.

Coating: Fusion bonded polyethelene.

Length: Appox 200.00 metres.

Location: From corner Compton Rd. and Allingham St. Kuraby, under railway lines, to AV254 Compton Rd. Kuraby.

Construction Drawings:

486/1/22-AA1T0001E Cathodic Protection Test Points

(4.0) CATHODIC PROTECTION DETAILS

(4.1) Type of Cathodic Protection: Sacrifical System.

(4.2) Cathode: The cathode point is located on the 600 mm dia main, adjacent to the air valve 254 at one end of the mild steel trunk main and the other cathode connection is mid way on the main near the railway bridge. The cathode point is where the cabling from the test point is attached to the structure under cathodic protection.

(4.3) Anodes: Two ten kg magnesium anodes were installed approximately one metre from the trunk main, one in a bed 2 metres deep at test point No1 and the second 2 metres deep at test point No.2.The anodes are backfilled with gypsum thereby improving anode - ground resistance. The anodes are located near the test points. See layout drawing.

(4.4) Test Points: Test points are installed on cathodically protected structures to enable testing to ensure full protection of the mains. On this main three test points have been installed.

(4.5) Associated Drawings:
Cathodic Protection Test Point Details - 486/1/22-AA1T0001E

(4.6) Associated Standards:
AS 3000 1991 Australia Wiring Rules
AS 2832.1 1991 Pipes, Cables, Ducts, Guide to Cathodic Protection, Part One.

(4.7) Government Regulations:
Queensland Electricity Acts and Regulations.

(5.0) PERFORMED TESTING

(1) Natural Potential Survey

(2) Soil Resistance Testing.

(3) Current Drain Survey

(4) Final Potential Survey and Commissioning.

(6.0) CONCLUSION

Full Cathodic protection has been achieved on this section of trunk main.

(7.0) MAINTENANCE

The cathodic protection system is maintained on a six monthly basis after commissioning. These checks involve testing operation and recording of pipe to soil potentials.

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Electrical Engineering Unit.
Cathodic Protection

Commissioning Results.

CPS 144 Compton Rd Kuraby 600 dia MSCL Trunk Main Relocation.

Test Point No.1 Compton Rd near Allingham St

1	Natural Potential (CuSo4 Ref. Cell)	- 486 mv
2	Polorised Potential ON (CuSo4 Ref)	- 1235 mv
3	Polorised Potential OFF (CuSo4 Ref)	- 1014 mv
4	Polorised Potential ON (Zinc Ref)	- 80 mv
5	Polorised Potential OFF (Zinc Ref)	+ 156 mv
6	Soil Resistivity at 2 metres	163.2 ohm metres
7	Anode Current	N/A

Test Point No.2 Mid point Compton Rd Relocation

1	Natural Potential (CuSo4 Ref. Cell)	- 546 mv
2	Polorised Potential ON (CuSo4 Ref)	- 1260 mv
3	Polorised Potential OFF (CuSo4 Ref)	- 1022 mv
4	Polorised Potential ON (Zinc Ref)	- 91 mv
5	Polorised Potential OFF (Zinc Ref)	+150 mv
6	Soil Resistivity at 2 metres	22.6 ohm metres
7	Anode Current	16.0 mA

Test Point No.3 Near AV 254 Compton Rd

1	Natural Potential (CuSo4 Ref. Cell)	- 427 mv
2	Polorised Potential ON (CuSo4 Ref)	- 1036 mv
3	Polorised Potential OFF (CuSo4 Ref)	- 920 mv
4	Polorised Potential ON (Zinc Ref)	+6 mv
5	Polorised Potential OFF (Zinc Ref)	+38 mv
6	Soil Resistivity at 2 metres	188.4 ohm metres
7	Anode Current	10.0 mA

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CPS 6 Monthly Maintenance Details.

Required:

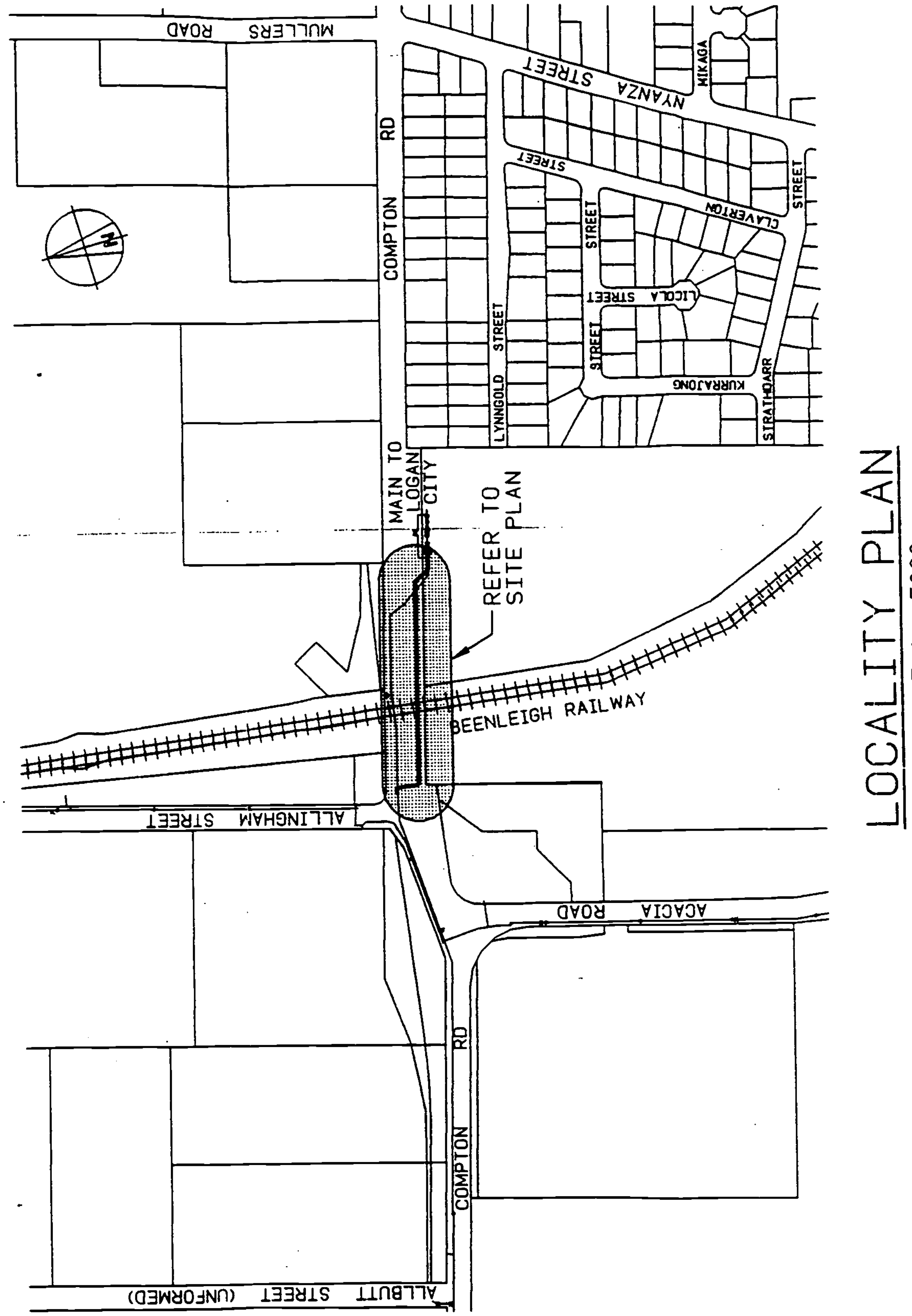
1/ Notify plant operator and/or sign entry logs where necessary.
2/ Have appropriate keying.
3/ Set of tools. (Electricians)
4/ Multimeter.
5/ DC clampmeter.
6/ Copper sulphate reference cell and leads.
7/ Cleaning equipment.
8/ Gatic cover lifters.

Labour:

One tradesperson electrical, one laborer, one vehicle.
Two hours per site.

Procedure:

1/ Identify system.
2/ Check system for operation.
3/ Record voltmeter.
4/ Record ammeter.
5/ Record "on" potentials for all test points.
6/ Record "instant off" potentials for all test points.
7/ Record "off" potentials for all test points.
8/ Perform loop resistance and record.
9/ Check and record anode string currents.
10/ Comments.
11/ Log entry.



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Brisbane Water Engineering Services

CP Form No. 16

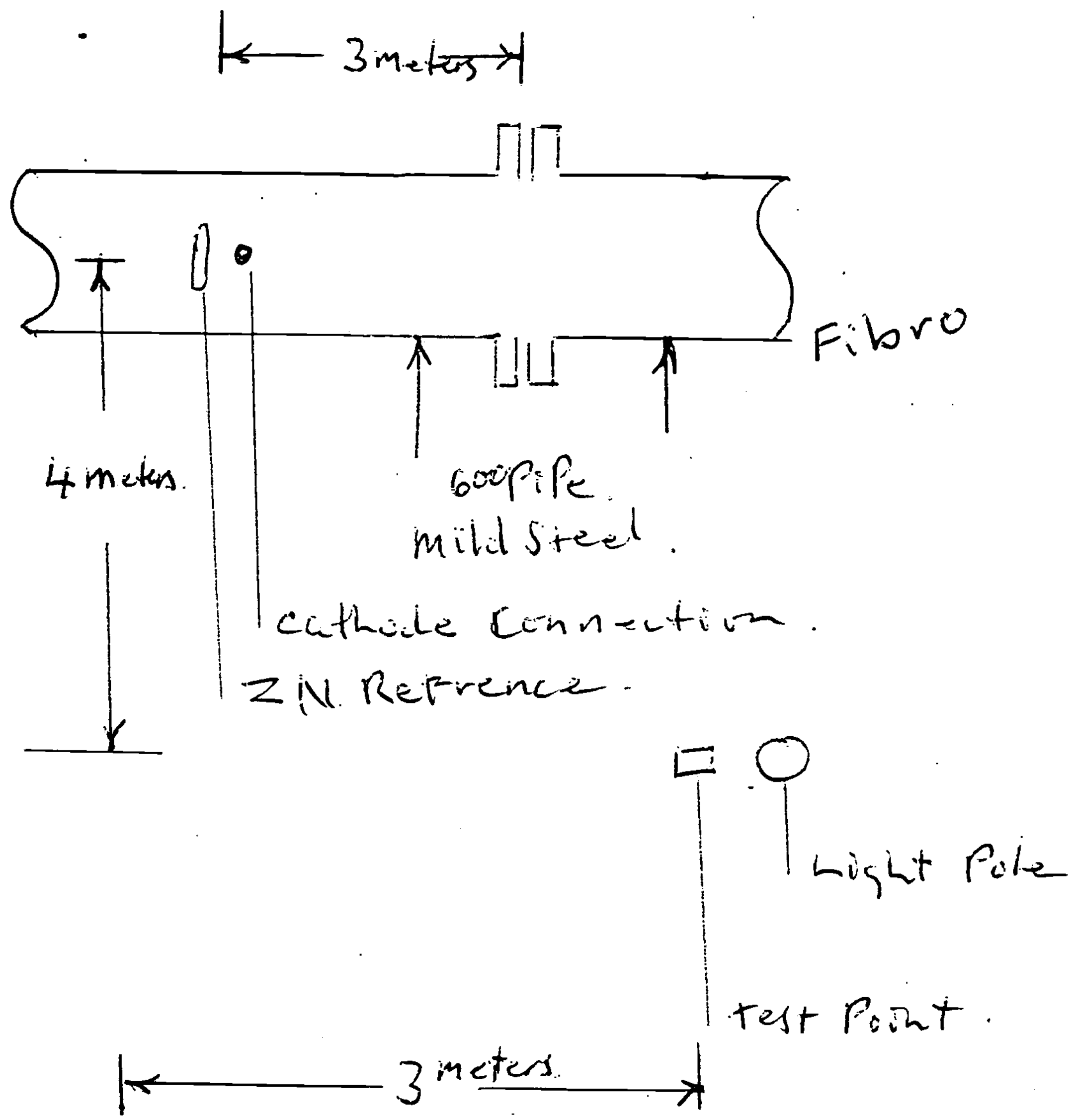
Electrical Engineering Unit

Site Plan Drawing Sheet

Project CP Crompton Rd Relocation.

Date 22-12-99.

Test Point 1



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Revision 09/28/95

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CP Form No. 16

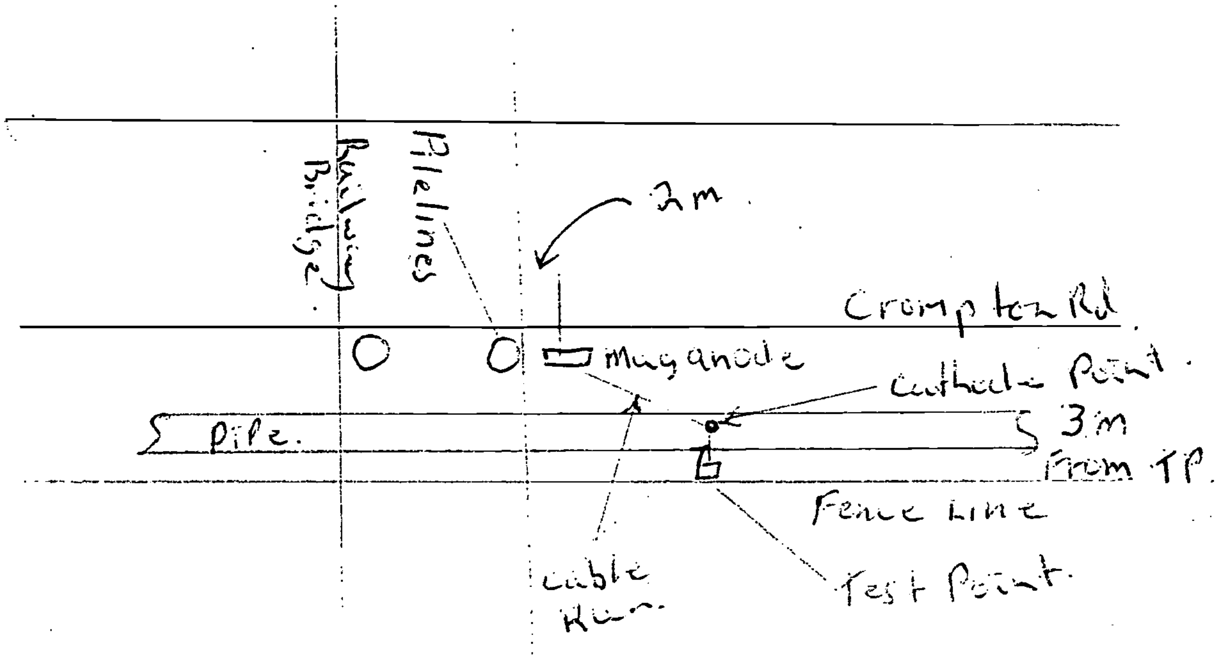
Electrical Engineering Unit

Site Plan Drawing Sheet

Project CP Crompton Rd Relocation.

Date 28-10-99

Test Point No 2.



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CP Form No. 16

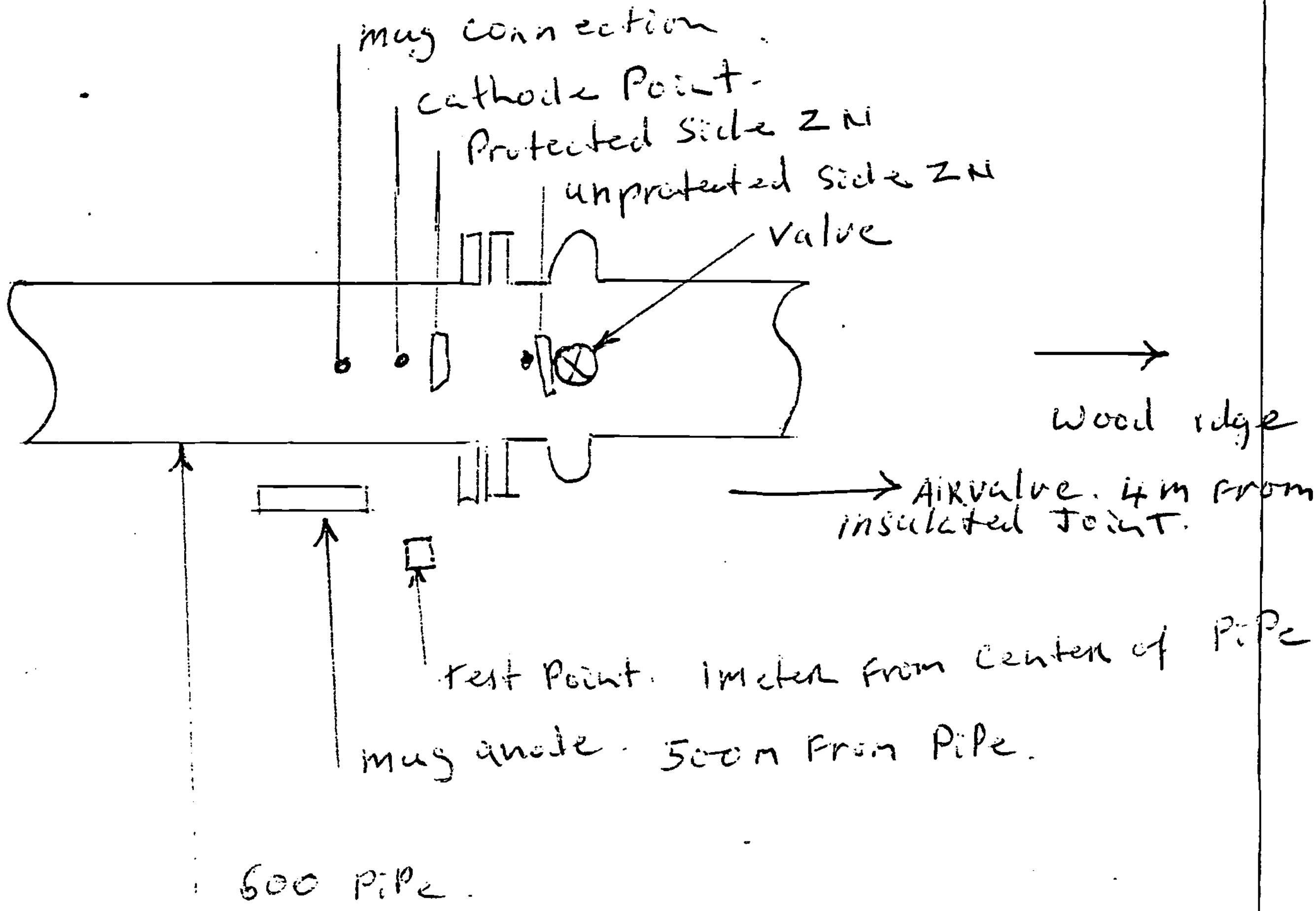
Electrical Engineering Unit

Site Plan Drawing Sheet

Project CP CRompton Rd Relocation.

Date 22-12-99

Test Point. 3



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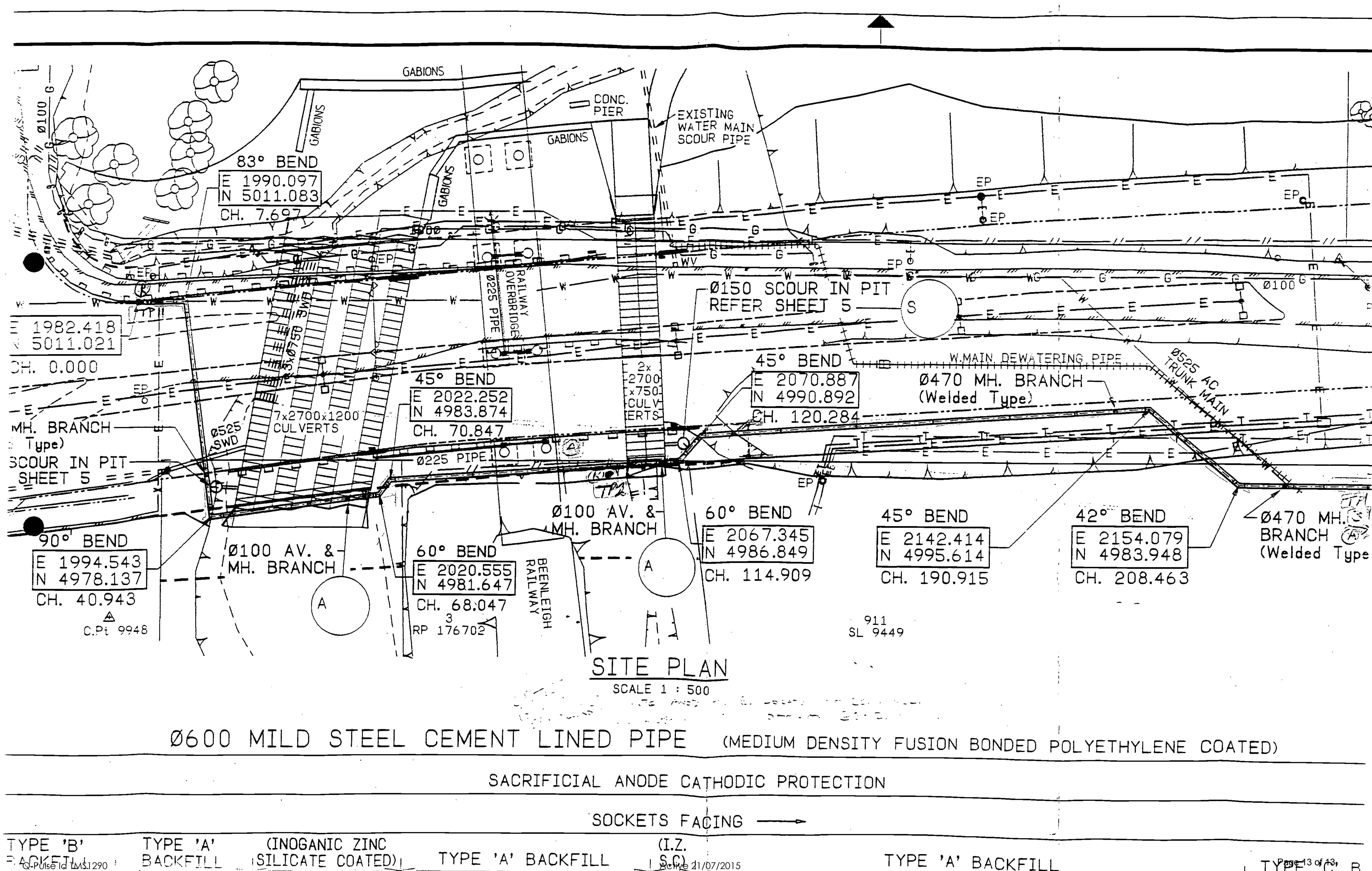
GABIONS
CONC. PIER
EXISTING WATER MAIN SCOUR PIPE
83° BEND
E 1990.097
N 5011.083
CH. 7.697
E 1982.418
N 5011.021
CH. 0.000
Ø150 SCOUR IN PIT REFER SHEET 5
Ø225 PIPE
RAILWAY OVERBRIDGE
45° BEND
E 2070.887
N 4990.892
CH. 120.284
Ø470 MH. BRANCH (Welded Type)
W.MAIN DEWATERING PIPE
Ø525 AC TRUNK MAIN
45° BEND
E 2022.252
N 4983.874
CH. 70.847
7x2700x1200 CULVERTS
2x 2700 x750 CULVERTS
Ø525 SWD
MH. BRANCH Type)
SCOUR IN PIT SHEET 5
90° BEND
E 1994.543
N 4978.137
CH. 40.943
C.Pt 9948
Ø100 AV. & MH. BRANCH
60° BEND
E 2020.555
N 4981.647
CH. 68.047
3 RP 176702
BEENLEIGH RAILWAY
Ø100 AV. & MH. BRANCH
60° BEND
E 2067.345
N 4986.849
CH. 114.909
45° BEND
E 2142.414
N 4995.614
CH. 190.915
911 SL 9449
42° BEND
E 2154.079
N 4983.948
CH. 208.463
Ø470 MH. BRANCH (Welded Type
SITE PLAN
SCALE 1 : 500
Ø600 MILD STEEL CEMENT LINED PIPE (MEDIUM DENSITY FUSION BONDED POLYETHYLENE COATED)
SACRIFICIAL ANODE CATHODIC PROTECTION
SOCKETS FACING
TYPE 'B' BACKFILL
TYPE 'A' BACKFILL
(INOGANIC ZINC SILICATE COATED)
TYPE 'A' BACKFILL
(I.Z. S.C)
TYPE 'A' BACKFILL
TYPE 'C' B